

THE FLORA OF THE WOLF ISLANDS
NEW BRUNSWICK*
PART I

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Dwarfed by the nearby Grand Manan Archipelago, the Wolf Islands have received scant attention since their discovery in 1603 by Champlain who gave them the picturesque name, "Les Isles des Perdreaux".

The "Wolves", as these islands are known, have been neglected for excellent reasons; they are both literally and figuratively overshadowed by Grand Manan which has long attracted visitors including botanists; they are so situated in the hazardous waters of the Bay of Fundy as to be unattractive to the usual run of visitors, except fishermen and rare yachtsmen.

The islands are not remote; North Head on Grand Manan is about 12 miles to the south, Campobello Island is 10 miles to the west and the mainland of New Brunswick not more than 8 miles away to the north. The most important factor in their isolation has probably been the nature of the Bay of Fundy itself, its extreme tidal currents and notorious meteorological conditions coupled with the rugged shore lines of the islands themselves.

Of all the accessible islands that lie off the North Atlantic Coast, these are the last to have yielded to the botanist. It

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* Collections of all taxa except *Lycopodium clavatum* were made at least once and often for most of the individual islands, but in the case of common and well-defined species, the records are based in major part of field observations made in July 1962. Specimens are deposited in the University of New Hampshire Herbarium.

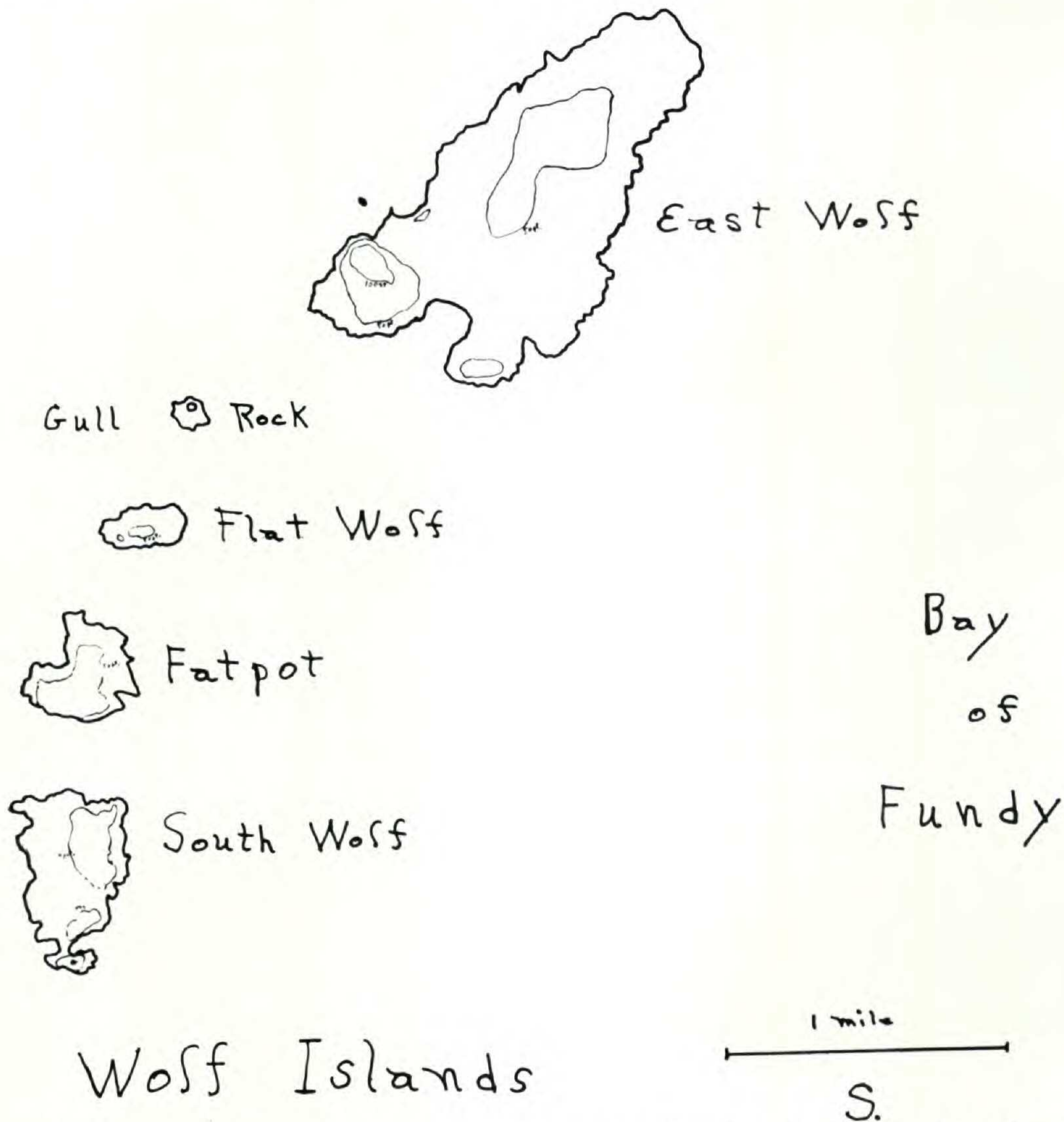


Fig. 1. Map of Wolf Islands, Pennfeld Parish, Charlotte Co., New Brunswick, Canada.

is doubtful indeed if there is anywhere a comparably neglected insular area so near a highly developed coast line.

It is the usual fate of islands in inhabited regions to be ravaged by man. This is true of the Grand Manan group, of Machias Seal and other islands that we have visited in the Bay of Fundy. But the Wolves, to a very considerable extent, have been preserved in nearly their original state. Of the 5 islands (see map), Fatpot and Flat Wolf seem to have been totally undisturbed, also South Wolf in major part and a very considerable portion of East Wolf. On South Wolf the Canadian Government maintains a lighthouse, the

keeper of which is the only year-round inhabitant. The area immediately around the lighthouse and a mere fringe of meadow on the western side of the island show the effects of man. Also there has been irregular summer occupancy of the Wolves by fishermen for a long time.

The Hawkins family of Beaver Harbor, New Brunswick, the present owners of East Wolf, have been very helpful in giving us information about the human history of the islands and also have pointed out several interesting species of plants. The occupancy of East Wolf has been sporadic over the years depending on the supply and demand for herring. Cows, pigs and chickens have been kept on the island during the summer fishing season at times, but no sheep were introduced. Thus the destruction of native vegetation has been confined to a few acres in the vicinity of the camps on Paul's Cove on the western side of the island. As is customary on many islands, rabbits have been introduced repeatedly to provide emergency food. These creatures were excessively abundant in 1959 on East Wolf but had declined almost to the point of disappearance by 1962. A great fire set by visiting fishermen many years ago burned the eastern end of East Wolf. Large areas nearer the center of East Wolf also were burned off or cleared many years ago providing at present a savannah-like aspect with scattered large trees mostly of *Betula papyrifera* var. *cordifolia*. The dominant forest trees, *Picea glauca* and *Abies balsamea*, seem to be very slow or quite ineffective in regenerating these cleared areas, many of which are now carpeted with almost unbroken mats of *Cornus canadensis*. Despite these alterations and undoubtedly the cutting of trees at times, the impression one forms after visiting any one of the Wolf Islands is of essentially wild and unspoiled nature — quite in contrast to the feeling evoked by a visit to the Grand Manan group. The virgin character of the coniferous forest is indicated by the deep carpet of lichens and mosses and perhaps by the abundance of three species of orchids; *Habenaria obtusata*, *H. clavellata*, and *Listera cordata*.

The granitic base of the islands rises sheer and bold with

very few landing places and only one semi-protected anchorage — at Paul's Cove on East Wolf. The islands are not high, the maximum elevation being about 100 feet, but there are imposing sea cliffs and yawning chasms on the seaward or eastern sides of all the islands, the best development of which occurs on South Wolf. Unlike Grand Manan and the principal other Bay of Fundy islands, the Wolves have no rocks of calcareous affinity nor basaltic origin and as might be expected no species of calcareous affinity occur there. On the smaller islands of the Wolves the soil seems to be entirely litter or humus down to bed rock. On South Wolf the land-bridge connecting the main island with the granite nubble where the lighthouse is placed, is a ridge with much gravel and water-worn cobbles indicating water deposition and a probable former beach line. Marine gravels and clays are revealed at the heads of small coves where the soil profiles are exposed by erosion.

Meteorological conditions can be judged somewhat from the weather bureau records at Eastport, and from Coast Guard and lighthouse records from West Quoddy Head in Lubec, both stations being in Maine within 10 - 15 miles from the Wolves. The temperature of the water of the Bay of Fundy varies little between the high of summer and the low of winter due to the great turbulence and mixing caused by the tides which range from 27.5 to 13.5 ft, the average for the year being 19 ft. The highest surface temperatures are between 52° and 54° F. in summer and the lowest winter temperature of the surface water is between 34° and 32° F. The winter extremes only occur during unusually cold, windy weather and usually in the winter the water is little colder than in the summer. This small range of water surface temperatures has a strong influence on the air temperatures surrounding the islands tending to moderate the seasonal extremes.

These same water temperatures strongly influence the atmospheric moisture producing "vapor" or "sea smoke" in winter and fog in spring and summer. Nearby Quoddy

Head in Maine has recorded periods of well over 300 hours of continuous fog. Thus the climate of the Wolves is not only decidedly maritime, but somewhat boreal, and in some respects almost montane. This distinctive local climate should be kept in mind during discussions of the flora of these islands.

While attending a botanical meeting in Montreal in August 1959, we discussed together the possibilities of doing some research on the Wolf Islands. The senior author had known of the Wolves since childhood and had frequently seen them on fogless days from Campobello. Neither of us had ever heard of any botanical work being carried on there, nor could we learn of any from the Canadian botanists with whom we talked. Therefore in September the senior author made two brief visits to the Wolves and brought back 62 taxa as representative and interesting samples of the flora. When we studied these it seemed appropriate to compare them with the "List of the Vascular Plants of Grand Manan" (Weatherby and Adams, *Contr. Gray Herb.* CLVIII, 1945.) Several taxa which were common on the Wolves were not listed at all from Grand Manan. Plans were made for further investigation of the Wolves in particular, but also of Grand Manan (*Rhodora* 64: 98-108, 1962). All subsequent visits have strengthened the early indications that there are significant differences between these two groups of islands. More detailed analyses of these island differences and other features of phytogeographic interest relating to the Wolves and other Fundian Islands will be covered in subsequent papers. Comparative studies of the floras of islands in North America have been grossly neglected though many fine studies of individual islands have been made.

After four seasons of study involving a total of fifteen days spent on the Wolves extending over a period from June to October in different years, we are impressed with the fact that there are many potential problems for investigation. The ecological features of islands so nearly virgin in character deserve attention. The small size of the islands

combined with their isolation have concentrated certain populations of unique character there, affording a natural laboratory for population studies in taxonomy.

LIST OF PLANTS OF THE WOLF ISLANDS*

	East Wolf	Fat Pot	Flat Wolf	South Wolf	Gull Rock
<i>Equisetum arvense</i> L. var. boreale (Bong.) Ledeb.	×			×	
<i>E. sylvaticum</i> L. var. pauciramosum Milde	×			×	
<i>Lycopodium annotinum</i> L. var. alpestre Hartm.	×				
<i>L. annotinum</i> L. var. pungens (La Pylaie) Desv.	×				
<i>L. clavatum</i> L.				×	
<i>L. obscurum</i> L. var. dendroideum (Michx.) D. C. Eat.	×	×			
<i>Botrychium simplex</i> E. Hitchc. var. tenebrosum (A. A. Eat.) Clausen	×				
<i>Osmunda Claytoniana</i> L.	×	×			
<i>O. cinnamomea</i> L.	×	×		×	
<i>Onoclea sensibilis</i> L.	×				
<i>Dryopteris Thelypteris</i> (L.) Gray var. pubescens (Lawson) Nakai	×				
<i>D. noveboracensis</i> (L.) Gray	×				
<i>D. disjuncta</i> (Ledeb.) C. V. Mort.	×	×			
<i>D. Phegopteris</i> (L.) Christens.	×				
<i>D. spinulosa</i> (O. F. Muell.) Watt var. spinulosa	×	×			
<i>D. spinulosa</i> (O. F. Muell.) Watt var. intermedia (Muhl.) Underw.	×				
<i>D. spinulosa</i> (O. F. Muell.) Watt var. americana (Fisch.) Fern.	×	×	×	×	
<i>D. cristata</i> (L.) Gray	×				
<i>Dennstaedtia punctilobula</i> (Michx.) Moore	×			×	
<i>Athyrium Filix-femina</i> (L.) Roth var. Michauxii (Spreng.) Farw.	×	×		×	
<i>A. Filix-femina</i> (L.) Roth var. Michauxii (Spreng.) Farw. f. laurentianum (Butters) Fern.				×	
<i>Polypodium virginianum</i> L.	×	×	×	×	
<i>Pteridium aquilinum</i> (L.) Kuhn var. latiusculum (Desv.) Underw.	×				

<i>Taxus canadensis</i> Marsh.						×
<i>Abies balsamea</i> (L.) Mill. var. <i>phanerolepis</i> Fern.	×	×	×	×		
<i>Picea glauca</i> (Moench) Voss	×	×	×	×		
<i>P. rubens</i> Sarg.	×	×				×
<i>P. mariana</i> (Mill.) BSP.	×					×
<i>Larix laricina</i> (DuRoi) K. Koch	×					
<i>Thuja occidentalis</i> L.	×					
<i>Ruppia maritima</i> L. var. <i>longipes</i> Hagstr.	×					
<i>Triglochin maritima</i> L.	×					
<i>Festuca rubra</i> L. var. <i>commutata</i> Gaudin	×	×	×	×		
<i>Puccinellia laurentiana</i> Fern. & Weath. var. <i>laurentiana</i>	×	×	×	×		
<i>P. paupercula</i> (Holm) Fern. & Weath. var. <i>paupercula</i>	×	×	×	×		
<i>P. paupercula</i> (Holm) Fern. & Weath. var. <i>alaskana</i> (Scribn. & Merr.) Fern. & Weath.	×	×	×	×		
<i>Glyceria canadensis</i> (Michx.) Trin.	×					
<i>Poa annua</i> L.	×	×	×	×		×
<i>P. compressa</i> L.	×					×
<i>P. pratensis</i> L.			×	×		×
<i>P. palustris</i> L.			×	×		×
<i>Agropyron trachycaulum</i> (Link) Malte var. <i>glaucum</i> (Pease & Moore) Malte						×
<i>A. trachycaulum</i> (Link) Malte var. <i>majus</i> (Vasey) Fern.					×	
<i>A. repens</i> (L.) Beauv. f. <i>aristatum</i> (Schum.) Holmb.	×			×	×	
<i>A. repens</i> (L.) Beauv. f. <i>trichorrhachis</i> Rohlena	×					×
<i>Elymus arenarius</i> L. var. <i>villosus</i> Mey.	×	×	×			×
<i>Deschampsia flexuosa</i> (L.) Trin. var. <i>flexuosa</i>	×	×			×	×
<i>D. flexuosa</i> (L.) Trin. var. <i>montana</i> (L.) Ledeb.	×	×	×	×		
<i>Danthonia spicata</i> (L.) Beauv.	×					
<i>Calamagrostis canadensis</i> (Michx.) Nutt. var. <i>robusta</i> Vasey	×	×	×	×	×	×
<i>C. canadensis</i> (Michx.) Nutt. var. <i>scabra</i> (Presl.) Hitchc.	×					
<i>Agrostis alba</i> L. var. <i>palustris</i> (Huds.) Pers.	×	×	×	×	×	×
<i>A. tenuis</i> Sibth.	×				×	
<i>A. scabra</i> Willd.	×				×	
<i>A. perennans</i> (Walt.) Tuckerm. var. <i>aestivalis</i> Vasey	×					×

<i>Cinna latifolia</i> (Trev.) Griseb.			×	×
<i>Phleum pratense</i> L.	×	×		×
<i>Alopecurus pratensis</i> L.	×			
<i>Anthoxanthum odoratum</i> L.	×			
<i>Hierochloë odorata</i> (L.) Beauv.	×			
<i>Eleocharis palustris</i> (L.) R. & S.	×			
<i>E. halophila</i> Fern. & Brack.	×			
<i>E. elliptica</i> Kunth	×			
<i>Scirpus validus</i> Vahl. var. <i>creber</i> Fern.	×			
<i>S. atrocinctus</i> Fern.	×			×
<i>Eriophorum spissum</i> Fern.	×			×
<i>E. tenellum</i> Nutt.	×			
<i>E. angustifolium</i> Honckeney	×			×
<i>E. virginicum</i> L.	×			
<i>Carex stipata</i> Muhl.	×			
<i>C. disperma</i> Dew.	×			
<i>C. trisperma</i> Dew.	×	×		×
<i>C. Mackenziei</i> Krecz.	×			
<i>C. canescens</i> L. var. <i>canescens</i>	×	×		×
<i>C. canescens</i> L. close to var. <i>disjuncta</i> Fern.	×			
<i>C. canescens</i> L. var. <i>subloliacea</i> Laestad.	×			×
<i>C. brunnescens</i> (Pers.) Poir. var. <i>sphaerostachya</i> (Tuckerm.) Kukenth.	×	×	×	×
<i>C. cephalantha</i> (Bailey) Bickn.	×			
<i>C. angustior</i> Mackenz.	×			
<i>C. scoparia</i> Schkuhr	×			×
<i>C. hormathodes</i> Fern.	×			×
<i>C. leptalea</i> Waslenb.	×			
<i>C. Emmonsii</i> Dew.				×
<i>C. paleacea</i> Wahlenb.	×			×
<i>C. crinita</i> Lam. var. <i>crinita</i>	×			×
<i>C. nigra</i> (L.) Reichard var. <i>nigra</i>	×			
<i>C. nigra</i> (L.) Reichard var. <i>strictiformis</i> (Bailey) Fern.	×			
<i>C. limosa</i> L.	×			
<i>C. paupercula</i> Michx. var. <i>irrigua</i> (Wahlenb.) Fern.	×			
<i>C. debilis</i> Michx. var. <i>Rudgei</i> Bailey	×			
<i>C. viridula</i> Michx.	×			×
<i>C. pauciflora</i> Lightf.	×			
<i>C. intumescens</i> Rudge var. <i>Fernaldii</i> Bailey	×			
<i>C. rostrata</i> Stokes var. <i>rostrata</i>	×			
<i>C. rostrata</i> Stokes var. <i>utriculata</i> (Boott) Bailey	×			×

Juncus bufonius L.	×	×	×	×
J. bufonius L. var. halophilus Buchenau & Fern.	×			
J. tenuis Willd.	×			
J. effusus L. var. Pylaei (Laharpe) Fern. & Wieg.	×			
J. balticus Willd. var. littoralis Engelm.	×		×	×
J. brevicaudatus (Engelm.) Fern.	×			×
Luzula multiflora (Retz.) Lejeune var. acadiensis Fern.	×			×
Clintonia borealis (Ait.) Raf.	×	×	×	×
Smilacina stellata (L.) Desf.	×		×	×
S. stellata (L.) Desf. var. crassa Vict.	×		×	
S. trifolia (L.) Desf.	×		×	×
Maianthemum canadense Desf.	×	×	×	×
Streptopus amplexifolius (L.) DC. var. americanus Schultes		×	×	×
S. roseus Michx. var. perspectus Fassett		×	×	×
Sisyrinchium montanum Greene var. crebrum Fern.	×		×	×
Iris Hookeri Penny	×	×		×
I. versicolor L.	×	×	×	×
Cypripedium acaule Ait.	×			
Habenaria clavellata (Michx.) Spreng. var. ophioglossoides Fern.			×	×
H. obtusata (Pursh) Richards.	×	×		×
Goodyera repens (L.) R. Br. var. ophioides Fern.	×			
Listera cordata (L.) R. Br.	×	×		×
Corallorhiza trifida Chatelain var. verna (Nutt.) Fern	×			
Salix rigida Muhl.	×			
S. Bebbiana Sarg. var. capreifolia Fern.	×			
S. pedicellaris Pursh var. hypoglauca Fern.	×			
S. discolor Muhl.	×			
S. humilis Marsh.	×			×
Populus tremuloides Michx.	×			
Myrica Gale L. var. Gale	×			
Betula lutea Michx. f.	×		×	×
B. populifolia Marsh.	×			×
B. papyrifera Marsh. var. papyrifera	×			
B. papyrifera Marsh. var. cordifolia (Regel) Fern.	×	×	×	×
Alnus crispa (Ait.) Pursh var. mollis Fern.	×			×

<i>A. rugosa</i> (Du Roi) Spreng. var. <i>americana</i> (Regel) Fern.	×				
<i>Urtica gracilis</i> Ait.	× ?		×	×	
<i>Rumex pallidus</i> Bigel.	×		×	×	
<i>R. domesticus</i> Hartm.		×	×	×	
<i>R. Acetosella</i> L.	×	×	×	×	×
<i>Polygonum aviculare</i> L.	×	×	×	×	×
<i>P. aviculare</i> L. var. <i>vegetum</i> Ledeb.				×	
<i>P. aviculare</i> L. var. <i>littorale</i> (Link) W. D. J. Koch		×		×	
<i>P. sagittatum</i> L.	×				
<i>P. Convolvulus</i> L.	×				
<i>Rheum Rhaponticum</i> L.	×				
<i>Chenopodium album</i> L.	×			×	
<i>Atriplex patula</i> L. var. <i>patula</i>	×				
<i>A. patula</i> L. var. <i>hastata</i> (L.) Gray	×	×		×	×
<i>A. glabriuscula</i> Edmondston	×		×	×	
<i>Suaeda</i> sp.	×				
<i>Spergularia marina</i> (L.) Griseb. var. <i>leiosperma</i> (Kindb.) Gurke	×	×	×	×	×
<i>Sagina procumbens</i> L.	×	×		×	
<i>S. nodosa</i> (L.) Fenzl	×				
<i>Arenaria lateriflora</i> L.	×	×	×	×	
<i>Stellaria media</i> (L.) Cyrillo	×	×		×	×
<i>S. graminea</i> L.	×	×			
<i>S. calycantha</i> (Ledeb.) Bong. var. <i>isophylla</i> Fern.	×	×	×	×	
<i>Cerastium vulgatum</i> L.	×	×	×	×	×
<i>Ranunculus Cymbalaria</i> Pursh	×				
<i>R. acris</i> L.	×	×		×	
<i>Thalictrum polygamum</i> Muhl. var. <i>polygamum</i>	×	×	×	×	×
<i>Coptis groenlandica</i> (Oeder) Fern.	×			×	
<i>Capsella rubella</i> Reut.	×				
<i>Cakile edentula</i> (Bigel.) Hook.	×		×		
<i>Raphanus Raphanistrum</i> L.	×				
<i>Sarracenia purpurea</i> L.	×				
<i>Drosera intermedia</i> Hayne	×				
<i>D. rotundifolia</i> L.	×			×	
<i>D. rotundifolia</i> L. var. <i>comosa</i> Fern.	×				
<i>Sedum Rosea</i> (L.) Scop.	×	×	×	×	×
<i>Mitella nuda</i> L.	×				
<i>Ribes hirtellum</i> Michx. var. <i>hirtellum</i>	×	×	×	×	
<i>R. hirtellum</i> Michx. var. <i>calcicola</i> Fern.		×			

<i>R. lacustre</i> (Pers.) Poir.	×				
<i>R. glandulosum</i> Grauer	×	×	×	×	
<i>Spiraea latifolia</i> (Ait.) Borkh.	×				
<i>Pyrus melanocarpa</i> (Michx.) Willd.	×				
<i>P. decora</i> (Sarg.) Hyland	×	×	×	×	
<i>Amelanchier laevis</i> Wieg.	×	×		×	
<i>A. laevis</i> Wieg. × <i>Bartramiana</i> (Tausch) Roemer	×	×		×	
<i>A. Bartramiana</i> (Tausch) Roemer				×	
<i>Fragaria virginiana</i> Duchesne var. <i>virginiana</i>	×	×		×	
<i>F. virginiana</i> Duchesne var. <i>terrae-novae</i> (Rydb.) Fern. & Wieg.	×				
<i>Potentilla palustris</i> (L.) Scop.	×				
<i>P. norvegica</i> L.	×	×	×	×	×
<i>P. simplex</i> Michx. var. <i>calvescens</i> Fern.	×			×	
<i>P. anserina</i> L.	×			×	
<i>P. Egedei</i> Wormsk. var. <i>groenlandica</i> (Tratt.) Polunin	×	×		×	
<i>Geum rivale</i> L. f. <i>virescens</i> Lilja	×				
<i>Rubus pubescens</i> Raf. var. <i>pubescens</i>	×	×	×	×	
<i>R. pubescens</i> Raf. var. <i>pilosifolius</i> A. F. Hill	×				
<i>R. idaeus</i> L. var. <i>aculeatissimus</i> Regel & Tiling	×				
<i>R. idaeus</i> L. var. <i>strigosus</i> (Michx.) Maxim.	×			×	×
<i>R. idaeus</i> L. var. <i>strigosus</i> (Michx.) Maxim. f. <i>tonsus</i> Fern.	×				
<i>R. idaeus</i> L. var. <i>canadensis</i> Richards.	×	×	×	×	
<i>R. vermontanus</i> Blanch.	×				
<i>R. canadensis</i> L.	×				
<i>R. allegheniensis</i> Porter	×				
<i>Rosa nitida</i> Willd.	×				
<i>R. virginiana</i> Mill.	×				
<i>Prunus pensylvanica</i> L. f	×		×		
<i>P. virginiana</i> L.	×				
<i>Trifolium pratense</i> L.	×			×	
<i>T. repens</i> L.	×	×		×	×
<i>Lathyrus japonicus</i> Willd. var. <i>pellitus</i> Fern.	×	×	×	×	
<i>L. palustris</i> L. var. <i>linearifolius</i> Ser.		×		×	
<i>L. palustris</i> L. var. <i>pilosus</i> (Cham.) Ledeb.	×	×	×	×	
<i>Oxalis montana</i> Raf.	×	×	×	×	
<i>Empetrum nigrum</i> (L.)	×	×		×	
<i>Ilex verticillata</i> (L.) Gray	×				
<i>Nemopanthus mucronata</i> (L.) Trel.	×	×		×	

	<i>E.W.</i>	<i>Fb+P</i>	<i>L.W.</i>	<i>Full</i>	
<i>Acer spicatum</i> Lam.	×	×	×	×	
<i>A. pensylvanicum</i> L.	×			×	
<i>A. rubrum</i> L.	×				
<i>Impatiens capensis</i> Meerb.	×		×		×
<i>Hypericum canadense</i> L.	×				
<i>H. virginicum</i> L. var. <i>Fraseri</i> (Spach) Fern.	×				
<i>Viola cucullata</i> Ait. var. <i>microtitis</i> Brainerd	×				
<i>V. septentrionalis</i> Greene	×			×	
<i>V. Mackloskii</i> Lloyd subsp. <i>pallens</i> (Banks) Baker	×			×	
<i>V. incognita</i> Brainerd var. <i>incognita</i>	×	×	×	×	
<i>V. incognita</i> Brainerd var. <i>Forbesii</i> Brainerd	×	×			
<i>Epilobium angustifolium</i> L. var. <i>angustifolium</i>	×	×	×	×	
<i>E. leptophyllum</i> Raf.	×			×	
<i>E. glandulosum</i> Lehm. var. <i>adenocaulon</i> (Haussk.) Fern.	×	×	×		
<i>E. glandulosum</i> Lehm. var. <i>occidentale</i> (Trel.) Fern.	×				
<i>Oenothera perennis</i> L.	×				
<i>Circaea alpina</i> L.	×	×	×	×	
<i>Aralia nudicaulis</i> L.	×	×	×	×	
<i>Carum Carvi</i> L.	×			×	
<i>Ligusticum scoticum</i> L.	×	×	×	×	×
<i>Coelopleurum lucidum</i> (L.) Fern.	×	×	×	×	×
<i>Conioselinum chinense</i> (L.) BSP.	×	×	×	×	
<i>Cornus canadensis</i> L.	×	×	×	×	
<i>C. stolonifera</i> Michx.	×				
<i>Moneses uniflora</i> (L.) Gray	×	×		×	
<i>Monotropa uniflora</i> L.	×	×		×	
<i>M. Hypopithys</i> L.	×				
<i>Ledum groenlandicum</i> Oeder	×			×	
<i>Rhododendron canadense</i> (L.) Torr.	×			×	
<i>Kalmia angustifolia</i> L.	×			×	
<i>K. polifolia</i> Wang.	×				
<i>Cassandra calyculata</i> (L.) D. Don	×				
<i>Gaultheria hispidula</i> (L.) Bigel.	×			×	
<i>Vaccinium angustifolium</i> Ait. var. <i>laevifolium</i> House	×			×	
<i>V. Vitis-Idaea</i> L. var. <i>minus</i> Lodd.	×	×		×	
<i>V. Oxycoccus</i> L.	×			×	
<i>V. Oxycoccus</i> L. var. <i>ovalifolium</i> Michx.	×	×		×	
<i>V. macrocarpon</i> Ait.	×	×		×	

<i>Trientalis borealis</i> Raf.	×	×	×	×
<i>Glaux maritima</i> L.	×			
<i>Lomatogonium rotatum</i> (L.) Fries f. <i>americanum</i> (Griseb.) Fern.				×
<i>Menyanthes trifoliata</i> L. var. <i>minor</i> Raf.	×			
<i>Convolvulus sepium</i> L. var. <i>sepium</i> <i>C. sepium</i> L. f. <i>malachophyllus</i> Fern.	×		×	×
<i>Mertensia maritima</i> (L.) S. F. Gray	×			×
<i>Scutellaria epilobiifolia</i> A. Hamilton	×			×
<i>Galeopsis Tetrahit</i> L. var. <i>bifida</i> (Boenn.) Lej. & Court.	×		×	
<i>Lycopus uniflorus</i> Michx.	×	×		×
<i>Euphrasia americana</i> Wettst.	×	×		×
<i>E. Randii</i> Robins. var. <i>Randii</i>	×	×		×
<i>E. Randii</i> Robins. var. <i>Farlowii</i> Robins.	×			
<i>E. canadensis</i> Townsend	×	×		×
<i>Rhinanthus Crista-galli</i> L. var. <i>fallax</i> (Wimm. & Grab.) Druce	×	×		×
<i>Plantago major</i> L.	×		×	
<i>P. juncoides</i> Lam. var. <i>decipiens</i> (Barneoud) Fern.	×	×	×	×
<i>P. juncoides</i> Lam. var. <i>glauca</i> (Hornem.) Fern.	×			
<i>P. juncoides</i> Lam. var. <i>laurentiana</i> Fern.				×
<i>P. oliganthos</i> R. & S. var. <i>fallax</i> Fern.	×			×
<i>Galium triflorum</i> Michx.	×	×	×	
<i>G. trifidum</i> L.	×			
<i>G. tinctorium</i> L.	×			
<i>G. tinctorium</i> L. var. <i>subbiflorum</i> (Wieg.) Fern.	×			
<i>G. labradoricum</i> Wieg.	×			
<i>Diervilla Lonicera</i> Mill.	×			
<i>Lonicera villosa</i> (Michx.) R. & S. var. <i>Solonis</i> (Eat.) Fern.	×			
<i>L. villosa</i> (Michx.) R. & S. var. <i>tonsa</i> Fern.	×			
<i>L. canadensis</i> Bartr.		×		×
<i>Linnaea borealis</i> L. var. <i>americana</i> (Forbes) Rehd.	×	×		×
<i>Viburnum cassinoides</i> L.	×	×		×
<i>Sambucus pubens</i> Michx.	×	×	×	×
<i>Campanula rotundifolia</i> L.	×	×	×	×
<i>C. rotundifolia</i> L. f. <i>albiflora</i> Rand and Redf.		×		
<i>Solidago macrophylla</i> Pursh	×	×	×	×
<i>S. sempervirens</i> L.	×	×	×	×

<i>S. uliginosa</i> Nutt. var. <i>terrae-novae</i> (T. & G.) Fern.	×				
<i>S. rugosa</i> Ait. var. <i>villosa</i> (Pursh) Fern.	×	×	×		×
<i>S. canadensis</i> L.	×				
<i>S. graminifolia</i> (L.) Salisb. var. <i>Nuttallii</i> (Greene) Fern.	×				
<i>Aster radula</i> Ait.	×				
<i>A. foliaceus</i> L. var. <i>arcuans</i> Fern.	×	×	×	×	×
<i>A. novi-belgii</i> L.				×	
<i>A. nemoralis</i> Ait.	×				
<i>A. acuminatus</i> Michx.	×	×	×	×	
<i>A. acuminatus</i> Michx. f. <i>discoideus</i> Ktze. or f. <i>virescens</i> Vict. & Rousseau	×				
<i>A. umbellatus</i> Mill. f. <i>intercedens</i> Fern.	×	×	×	×	
<i>A. umbellatus</i> Mill. var. <i>pubens</i> Gray	×	×			×
<i>Anaphalis margaritacea</i> (L.) C. B. Clarke var. <i>subalpina</i> Gray	×				
<i>Gnaphalium uliginosum</i> L.	×				
<i>Bidens frondosa</i> L.	×		×		
<i>Achillea borealis</i> Bong.	×	×	×	×	×
<i>A. lanulosa</i> Nutt.	?	×		×	
<i>Matricaria matricarioides</i> (Less.) Porter	×	×	×	×	×
<i>Chrysanthemum Leucanthemum</i> L.	×			×	
<i>Senecio vulgaris</i> L.	×				
<i>S. sylvaticus</i> L.	×			×	
<i>Cirsium vulgare</i> (Savi) Tenore				×	
<i>C. muticum</i> Michx.			×	×	
<i>C. arvense</i> (L.) Scop.	×			×	
<i>Leontodon autumnalis</i> L.	×			×	
<i>Taraxacum erythrospermum</i> Andrz.	×				
<i>T. officinale</i> Weber	×				
<i>Sonchus arvensis</i> L.	×			×	
<i>S. asper</i> (L.) Hill	×				
<i>Prenanthes trifoliolata</i> (Cass.) Fern. var. <i>nana</i> (Bigel.) Fern.	×	×		×	
<i>P. altissima</i> L. f. <i>integra</i> Rousseau		×	×		
<i>Hieracium aurantiacum</i> L.	×				
<i>H. floribundum</i> Wimm. & Grab.	×			×	

We have made an attempt to get a practically complete list of taxa from each island to determine the relationship between the area of land involved and the number of taxa. Table I shows the estimated relative areas of the Wolf

Islands with the numbers of taxa we have now recorded from each. Undoubtedly there will be some slight changes in the totals, as previously undetected plants come to our attention. The present figures show a substantially correct picture of the relationship of the numbers present to the areas of the individual Wolf Islands. The areal scale was established by regarding Gull Rock, the smallest, as a unit of one and the others as multiples of this unit. Thus with Gull Rock as one, we gave Flat Wolf, the next largest, which is about three times as large, the factor of three and so on up to forty-two for East Wolf, the largest of the islands.

Table I

Total Taxa recorded 314

	East Wolf	South Wolf	Fat Pot	Flat Wolf	Gull Rock
Comparative areas of islands	42	12	6	3	1
Taxa recorded	283	163	115	95	29
Ratio of taxa to area	6.7	13.5	18.1	31.6	29*

*Weather conditions prevented a final collection from Gull Rock which undoubtedly would have added several species to the list.

The larger islands (East and South Wolf) present greater habitat possibilities not only because larger areas provide more ecological niches such as bogs, swamps, barrier beaches, etc., but also because nearly all of the disturbed areas are and have been on these islands. On the other hand, the three smaller islands, particularly Gull Rock, have bird nesting colonies which may strongly influence the presence and absence of various taxa. Regardless of the other factors involved, the number of taxa present bears a fairly distinct relationship to the area involved, with a descending ratio to area as the total area increases. The comparison is an interesting one and should be further tested as more island studies are carried on.

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